

Please amend claim 21 to read:

21. A stacked MCM package comprising a substrate, a digital MCM, and an RF MCM all electrically interconnected one on top of another by means of solder bumps, a first electrical connection between the digital MCM and the substrate, a second electrical connection between the RF MCM and the substrate, the first and second electrical connections being electrically isolated from one another.

#### REMARKS

Reconsideration of the rejection of the subject matter of this application is requested.

#### CLAIM STATUS

Claims 1-21 were originally presented. Claims 1, 10-12, and 19-21 have been examined. Claims 2-9 and 13-18 were withdrawn from consideration on their merits by the Examiner over the objection of applicants. They have received no substantive examination.

#### BACKGROUND

A brief summary of the invention as claimed will be given. This is intended to aid in the discussion below both in regard to the holding of claims 2-9, and 13-18 as non-elected, and the discussion of the distinctions between the claimed invention and the cited prior art.

The invention is a stacked MCM package in which both RF and digital MCMs are stacked on top of one another. The I/Os in the RF MCM are isolated from the digital

MCM by routing dedicated RF I/O interconnections straight through the digital MCM, without any electrical connections to the digital MCM. In that sense these I/O interconnections are passive with respect to the digital MCM substrate, and are isolated from all electrical interconnections to the digital MCM. That is the essence of the invention. It is claimed in every claim of the application. The concept is illustrated in Figs. 6 and 7.

### **RESTRICTION REQUIREMENT**

In the first Office action, election of species was required. Applicants traversed the requirement on the ground that the requirement was improper and that all claims in the application read on all of the figures that were identified as separate species.

Applicants continue to assert that the requirement for election of species is in error. In particular, applicants assert that the Examiner's analysis of the claims readable on the elected species is incorrect.

In both cases there is evidently a misreading of the claims and their relationship to one another, or a misunderstanding of the invention, or both.

In making the requirement for election of species the Examiner quoted language from MPEP section 8.14. That section relates to distinguishing claims to intermediate products from claims to products. There is no such situation here. There is no intermediate product.

The election requirement identified five species:

Fig. 3

Fig. 4

Figs. 6-7

Fig. 8

Figs. 9-11

To be responsive, applicants elected Fig. 3, even though Fig. 3 is not a distinct species of the invention. Fig. 3 shows a digital MCM. A digital MCM, which includes by definition the device shown in Fig. 3, is claimed in claims 1, 2, 3, 10, 13, 19 and 21, i.e. every independent claim in the application. The same is true of Fig. 4. The same is true of Figs. 6 and 7, which illustrate the electrical isolation between RF MCM interconnections and a digital MCM substrate. That element or feature is in every independent claim, and therefore every claim of the 21 claims initially presented. There is no claim in the application that is specifically directed to Fig. 3. Nor is there any claim in the application that is specifically directed to Fig. 4. This demonstrates clearly that the election requirement is improper. It purports to impose an election between figures that have no claims directed to them. A requirement for restriction is designed to reduce the number of claims that need to be examined. If there are no claims to the identified "species" how is that accomplished?

The Examiner is invited to state specifically what in claim 2, for instance, makes that claim not readable on Fig. 3, the elected figure. Otherwise, applicants request that claim 2, as well as every other claim that cannot be separated from Fig. 3 (i.e., all claims) be examined.

### **OBJECTION**

The specification is objected to as lacking support for a phrase in claim 21.

Since that is actually the basis for a rejection under 35 U.S.C. 112 it will be discussed below in the context of the rejection.

### **DRAWING**

The drawing is objected to as not showing the ground connection to the digital MCM, the ground connection to the RF MCM, and the electrical isolation between them. Referring to Fig. 7, the RF ground is shown and 82, 83 (82 is electrically connected to 83 as shown in Fig. 7). The ground connection between the digital MCM and the substrate is one or more of the solder bumps 27 in Fig. 3. The RF ground in Fig. 7 is shown as connecting electrically through the digital board 71 without an electrical interconnection to the digital board. This illustration, when combined with the description at the bottom of page 11 et seq., inter alia, clearly shows the claimed relationship. It is noted that claim 21 as amended now refers to electrical connections.

### **REJECTION**

Claim 21 stands rejected under 35 U.S.C. 112 as indefinite.

Claim 1 stands rejected under 35 U.S.C. 103(a) as being unpatentable over applicants' admitted prior art in view of Hultmark et al.

Claim 10-12 and 19-20 stand rejected under 35 U.S.C. 103(a) as being unpatentable over applicants' admitted prior art in view of Akram et al. and further in view of Vendramin.

## **ARGUMENT**

### **Rejection under 35 U.S.C. 112**

Claim 21 has been amended to clarify the relationships that were found unclear or objectionable by the Examiner. The claim is drafted deliberately to cover the case where the RF MCM overlies the digital MCM as well as the case where the digital MCM overlies the RF MCM. It is noted that none of the references cited show either relationship.

Claim 21 appears not to have been rejected on prior art and is, to the extent it is now definite (i.e. not contrary to the requirements of 35 U.S.C. 112) it should be allowable.

### **Rejection under 35 U.S.C. 103(a) – claim 1**

Claim 1 stands rejected as unpatentable over Hultmark et al. The Hultmark et al. patent shows a stacked IC chip arrangement where all the IC chips are digital. This neither presents the problems addressed by applicants' invention or makes obvious the claimed RF MCM/digital MCM stacked combination. Stacked chip arrangements where all chips are digital are known. The suggestion that since applicants show RF and digital IC modules mounted side by side on a substrate this makes obvious the stacking of RF and digital IC devices, or that the Hultmark et al. patent makes that obvious, even though Hultmark et al. never mention RF devices, is at the heart of the issue. That is the essence of the invention. Stacking RF and digital MCMs has been avoided in the prior art because of the difficulties described in applicants' specification. Since applicants have taught how to solve those problems, and therefore how to implement a

stack of RF and digital modules, it would seem to follow that a claim to that arrangement is both novel and patentable.

Claim 1 now clearly specifies that the stacked IC chips, i.e. the digital MCM and the RF MCM are not electrically connected. Note the following passage from the Hultmark et al. patent (col. 4, lines 34-38):

“FIG. 2B is a side view of a stacked chip assembly comprising a larger chip electrically connected to an intermediate chip, which intermediate chip is electrically connected to another chip.”

#### **Rejection under 35 U.S.C. 103(a) – claims 10-12, 19, 20**

Claims 10-12, 19 and 20 stand rejected as unpatentable over applicants' admitted prior art in view of Akram et al. and further in view of Vendramin. The relevance of applicants' prior art has just been discussed. The Akram et al. patent shows a stack of devices which resembles closely the digital MCMs shown in Figs. 3 and 4. The Akram et al. patent never mentions RF devices. So the Akram et al. patent discloses no more than what was shown as background in applicants' specification. As such it is simply cumulative. There is no real combination of references since both show the same thing, i.e. a single digital MCM.

Moreover, the Akram et al. patent lacks any suggestion that one stacked device is electrically isolated from another. Note the following passage from the Akram et al. patent (col. 3, line 50 et seq.):

“The substrates are preferably stacked atop one another by electric connections which are ball or column-like structures. Alternately, solder

bumps or balls may be formed on the substrate. The electric connections achieve electric communication between the stacked substrates."

The Vendramin patent describes Faraday cage structure for RF devices. There is no justifiable reason to combine the Vendramin patent with the Akram et al patent because a Faraday cage in the Akram et al. device would serve no function useful to Akram et al. It is only if some of the devices are RF devices and some of the devices are digital devices, with one stacked on the other, that any such combination could be considered proper or relevant. But that is not the case. The only such teaching that exists in the record is applicants'.

#### **CONCLUSION**

Accordingly it is believed that claims 1-21 distinguish from the cited references and define patentable subject matter. Allowance of these claims is requested.

In the event that the Examiner concludes that a telephone call would advance the prosecution of this application, the Examiner is invited and encouraged to call the undersigned attorney at Area Code 757-258-9018.

Respectfully,



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## **MARKED-UP CLAIMS**

1. A stacked MCM package comprising a substrate, a digital MCM on the substrate, [and] an RF MCM on the digital MCM, and means electrically connecting the RF MCM to the substrate, and wherein the RF MCM and the digital MCM are electrically isolated [all electrically interconnected one on top of another].

21. A stacked MCM package comprising a substrate, a digital MCM, and an RF MCM all electrically interconnected one on top of another by means of solder bumps, a first [ground] electrical connection [to] between the digital MCM and the substrate, a second [ground] electrical connection [to] between the RF MCM and the substrate, the first and second [ground] electrical connections being electrically isolated from one another.